

# SN54ABT841, SN74ABT841A 10-BIT BUS-INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCBS196D – FEBRUARY 1991 – REVISED MAY 1997

- State-of-the-Art *EPIC-IIB™* BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical  $V_{OLP}$  (Output Ground Bounce) < 1 V at  $V_{CC} = 5$  V,  $T_A = 25^\circ\text{C}$
- High-Impedance State During Power Up and Power Down
- High-Drive Outputs (–32-mA  $I_{OH}$ , 64-mA  $I_{OL}$ )
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flat (W) Package, and Plastic (NT) and Ceramic (JT) DIPs

## description

The SN54ABT841 and SN74ABT841A 10-bit latches are designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The ten transparent D-type latches provide true data at their outputs.

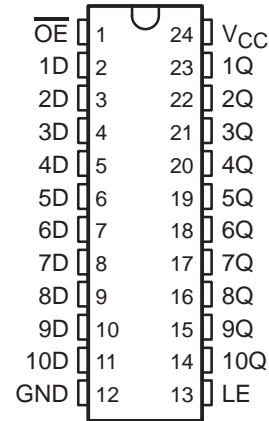
A buffered output-enable ( $\overline{OE}$ ) input can be used to place the ten outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without need for interface or pullup components.

$\overline{OE}$  does not affect the internal operations of the latch. Previously stored data can be retained or new data can be entered while the outputs are in the high-impedance state.

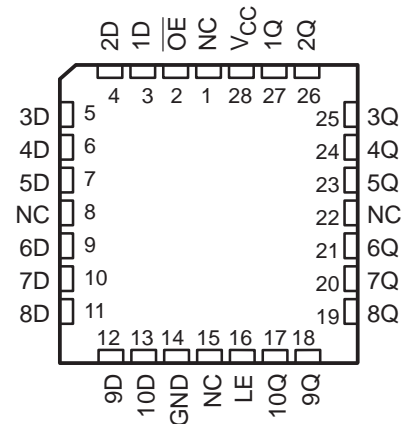
When  $V_{CC}$  is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT841 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74ABT841A is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54ABT841 . . . JT OR W PACKAGE  
SN74ABT841A . . . DB, DW, NT, OR PW PACKAGE  
(TOP VIEW)



SN54ABT841 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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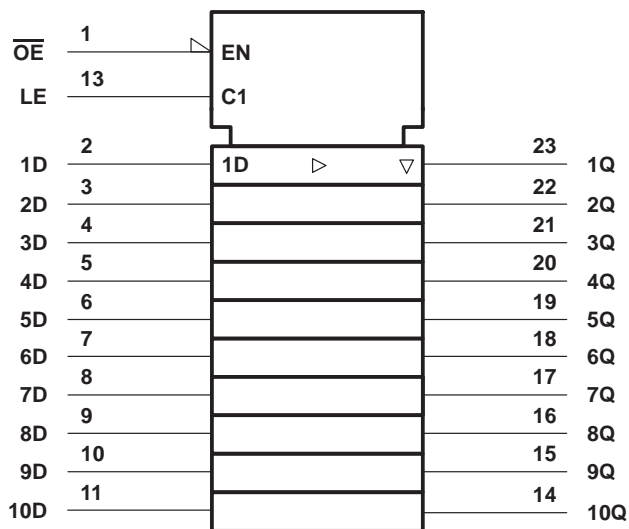
# SN54ABT841, SN74ABT841A 10-BIT BUS-INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

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FUNCTION TABLE

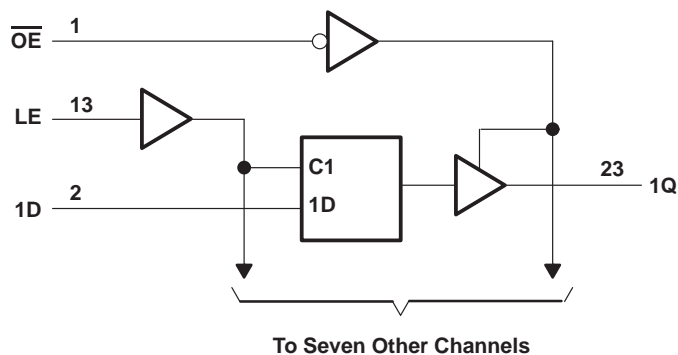
INPUTS			OUTPUT
$\overline{OE}$	LE	D	Q
L	H	H	H
L	H	L	L
L	L	X	$Q_0$
H	X	X	Z

## logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DB, DW, JT, NT, PW, and W packages.

## logic diagram (positive logic)



Pin numbers shown are for the DB, DW, JT, NT, PW, and W packages.

# SN54ABT841, SN74ABT841A

## 10-BIT BUS-INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

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### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage range, $V_{CC}$ .....	–0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) .....	–0.5 V to 7 V
Voltage range applied to any output in the high or power-off state, $V_O$ .....	–0.5 V to 5.5 V
Current into any output in the low state, $I_O$ : SN54ABT841 .....	96 mA
SN74ABT841A .....	128 mA
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	–18 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	–50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package .....	104°C/W
DW package .....	81°C/W
NT package .....	67°C/W
PW package .....	120°C/W
Storage temperature range, $T_{stg}$ .....	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51, except for through-hole packages, which use a trace length of zero.

### recommended operating conditions (see Note 3)

	SN54ABT841		SN74ABT841A		UNIT
	MIN	MAX	MIN	MAX	
$V_{CC}$ Supply voltage	4.5	5.5	4.5	5.5	V
$V_{IH}$ High-level input voltage	2		2		V
$V_{IL}$ Low-level input voltage		0.8		0.8	V
$V_I$ Input voltage	0	$V_{CC}$	0	$V_{CC}$	V
$I_{OH}$ High-level output current		–24		–32	mA
$I_{OL}$ Low-level output current		48		64	mA
$\Delta t/\Delta v$ Input transition rise or fall rate		5		5	ns/V
$\Delta t/\Delta V_{CC}$ Power-up ramp rate		200		200	μs/V
$T_A$ Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused inputs must be held high or low to prevent them from floating.



# SN54ABT841, SN74ABT841A

## 10-BIT BUS-INTERFACE D-TYPE LATCHES

### WITH 3-STATE OUTPUTS

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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54ABT841		SN74ABT841A		UNIT	
		MIN	TYP†	MAX	MIN	MAX	MIN	MAX		
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = -18 mA			-1.2		-1.2		-1.2	V	
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -3 mA			2.5		2.5		2.5	V	
	V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -3 mA			3		3		3		
	V <sub>CC</sub> = 4.5 V	I <sub>OH</sub> = -24 mA			2					
		I <sub>OH</sub> = -32 mA						2		
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V	I <sub>OL</sub> = 48 mA						0.55	V	
		I <sub>OL</sub> = 64 mA						0.55*		
V <sub>hys</sub>				100					mV	
I <sub>I</sub>	V <sub>CC</sub> = 0 to 5.5 V, V <sub>I</sub> = V <sub>CC</sub> or GND			±1		±1		±1	μA	
I <sub>OZPU</sub> ‡	V <sub>CC</sub> = 0 to 2.1 V, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	μA	
I <sub>OZPD</sub> ‡	V <sub>CC</sub> = 2.1 V to 0, V <sub>O</sub> = 0.5 V to 2.7 V, $\overline{OE} = X$			±50		±50		±50	μA	
I <sub>OZH</sub>	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 2.7 V, $\overline{OE} \geq 2$ V			10		10		10	μA	
I <sub>OZL</sub>	V <sub>CC</sub> = 2.1 V to 5.5 V, V <sub>O</sub> = 0.5 V, $\overline{OE} \geq 2$ V			-10		-10		-10	μA	
I <sub>off</sub>	V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> ≤ 4.5 V			±100				±100	μA	
I <sub>CEX</sub>	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 5.5 V	Outputs high				50		50	μA	
I <sub>O</sub> §	V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.5 V			-50	-140	-180		-50	-180	mA
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	Outputs high			1**	250**		280	250	μA
		Outputs low			24**	38††**		45††	38††	mA
		Outputs disabled			0.5**	250**		280	250	μA
ΔI <sub>CC</sub> #	V <sub>CC</sub> = 5.5 V, One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	Outputs enabled				1.5		1.5	1.5	mA
		Outputs disabled				250**		280	250	μA
		Control inputs				1.5		1.5	1.5	mA
C <sub>i</sub>	V <sub>I</sub> = 2.5 V or 0.5 V			4					pF	
C <sub>o</sub>	V <sub>O</sub> = 2.5 V or 0.5 V			7					pF	

\* On products compliant to MIL-PRF-38535, this parameter does not apply.

\*\* These limits apply only to the SN74ABT841A.

† All typical values are at V<sub>CC</sub> = 5 V.

‡ This parameter is characterized, but not production tested.

§ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

†† This limit may vary among suppliers.

# This is the increase in supply current for each input that is at the specified TTL voltage level rather than V<sub>CC</sub> or GND.

timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

		V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25°C		SN54ABT841		SN74ABT841A		UNIT	
		MIN	MAX	MIN	MAX	MIN	MAX		
t <sub>w</sub>	Pulse duration, LE high or low			3.3		3.3		3.3	ns
t <sub>su</sub>	Setup time, data before LE↓	High		2.5		2.5		2.5	ns
		Low		1.5		1.5		1.5	
t <sub>h</sub>	Hold time, data after LE↓	High		1.5		1.5		1.5	ns
		Low		1.5		2		1.5	



**SN54ABT841, SN74ABT841A**  
**10-BIT BUS-INTERFACE D-TYPE LATCHES**  
**WITH 3-STATE OUTPUTS**

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54ABT841				UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN		MAX
			MIN	TYP	MAX			
$t_{PLH}$	D	Q	1†	4.1	5.5	1†	6.8	ns
$t_{PHL}$			1.5†	4	5.5	1.5†	6.8	
$t_{PLH}$	LE	Q	1.6†	4.1	6.6†	1.6†	7.4	ns
$t_{PHL}$			2†	4.6	6.2	2†	6.8	
$t_{PZH}$	$\overline{OE}$	Q	1	3	4.9†	1	5.8	ns
$t_{PZL}$			2.2	4.1	5.7†	2.2	6.5	
$t_{PHZ}$	$\overline{OE}$	Q	2†	4.7	6.2	2†	7.2	ns
$t_{PLZ}$			1.5†	4.6	6.1	1.5†	6.6	

† This data sheet limit may vary among suppliers.

switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT841A				UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN		MAX
			MIN	TYP	MAX			
$t_{PLH}$	D	Q	1.4†	4.1	5.5	1.4†	6.2†	ns
$t_{PHL}$			1.5†	4	5.5	1.5†	6.2	
$t_{PLH}$	LE	Q	2.1†	4.1	5.9†	2.1†	6.5†	ns
$t_{PHL}$			2.4†	4.6	6.2	2.4†	6.7	
$t_{PZH}$	$\overline{OE}$	Q	1	3	4.7†	1	5.3†	ns
$t_{PZL}$			2.2	4.1	5.7†	2.2	6.3†	
$t_{PHZ}$	$\overline{OE}$	Q	2.6†	4.7	6.2	2.6†	7.1	ns
$t_{PLZ}$			1.9†	4.6	6.1	1.9†	6.5	

† This data sheet limit may vary among suppliers.

# SN54ABT841, SN74ABT841A 10-BIT BUS-INTERFACE D-TYPE LATCHES WITH 3-STATE OUTPUTS

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## PARAMETER MEASUREMENT INFORMATION

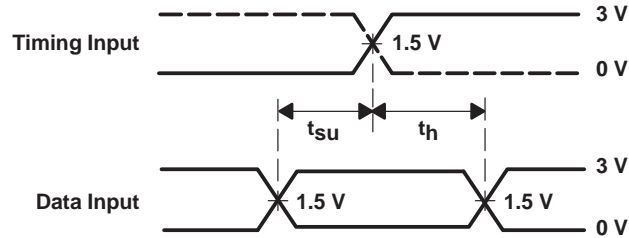


LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	7 V
$t_{PHZ}/t_{PZH}$	Open



VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .  
D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">5962-9676901QLA</a>	Active	Production	CDIP (JT)   24	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9676901QL A SNJ54ABT841JT
<a href="#">SN74ABT841ADBR</a>	Active	Production	SSOP (DB)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
SN74ABT841ADBR.B	Active	Production	SSOP (DB)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
SN74ABT841ADBRE4	Active	Production	SSOP (DB)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
<a href="#">SN74ABT841ADW</a>	Active	Production	SOIC (DW)   24	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT841A
SN74ABT841ADW.B	Active	Production	SOIC (DW)   24	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT841A
SN74ABT841ADWG4	Active	Production	SOIC (DW)   24	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT841A
<a href="#">SN74ABT841ADWR</a>	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT841A
SN74ABT841ADWR.B	Active	Production	SOIC (DW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT841A
<a href="#">SN74ABT841APW</a>	Active	Production	TSSOP (PW)   24	60   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
SN74ABT841APW.B	Active	Production	TSSOP (PW)   24	60   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
<a href="#">SN74ABT841APWR</a>	Active	Production	TSSOP (PW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
SN74ABT841APWR.B	Active	Production	TSSOP (PW)   24	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AB841A
<a href="#">SNJ54ABT841JT</a>	Active	Production	CDIP (JT)   24	15   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-9676901QL A SNJ54ABT841JT

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

**(6) Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74ABT841ADBR	SSOP	DB	24	2000	330.0	16.4	8.2	8.8	2.5	12.0	16.0	Q1
SN74ABT841ADWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74ABT841APWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT841ADBR	SSOP	DB	24	2000	353.0	353.0	32.0
SN74ABT841ADWR	SOIC	DW	24	2000	350.0	350.0	43.0
SN74ABT841APWR	TSSOP	PW	24	2000	353.0	353.0	32.0

**TUBE**


\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT841ADW	DW	SOIC	24	25	506.98	12.7	4826	6.6
SN74ABT841ADW.B	DW	SOIC	24	25	506.98	12.7	4826	6.6
SN74ABT841ADWG4	DW	SOIC	24	25	506.98	12.7	4826	6.6
SN74ABT841APW	PW	TSSOP	24	60	530	10.2	3600	3.5
SN74ABT841APW.B	PW	TSSOP	24	60	530	10.2	3600	3.5

JT (R-GDIP-T\*\*)

CERAMIC DUAL-IN-LINE

24 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

PW0024A



**PACKAGE OUTLINE**  
**TSSOP - 1.2 mm max height**

SMALL OUTLINE PACKAGE



NOTES:

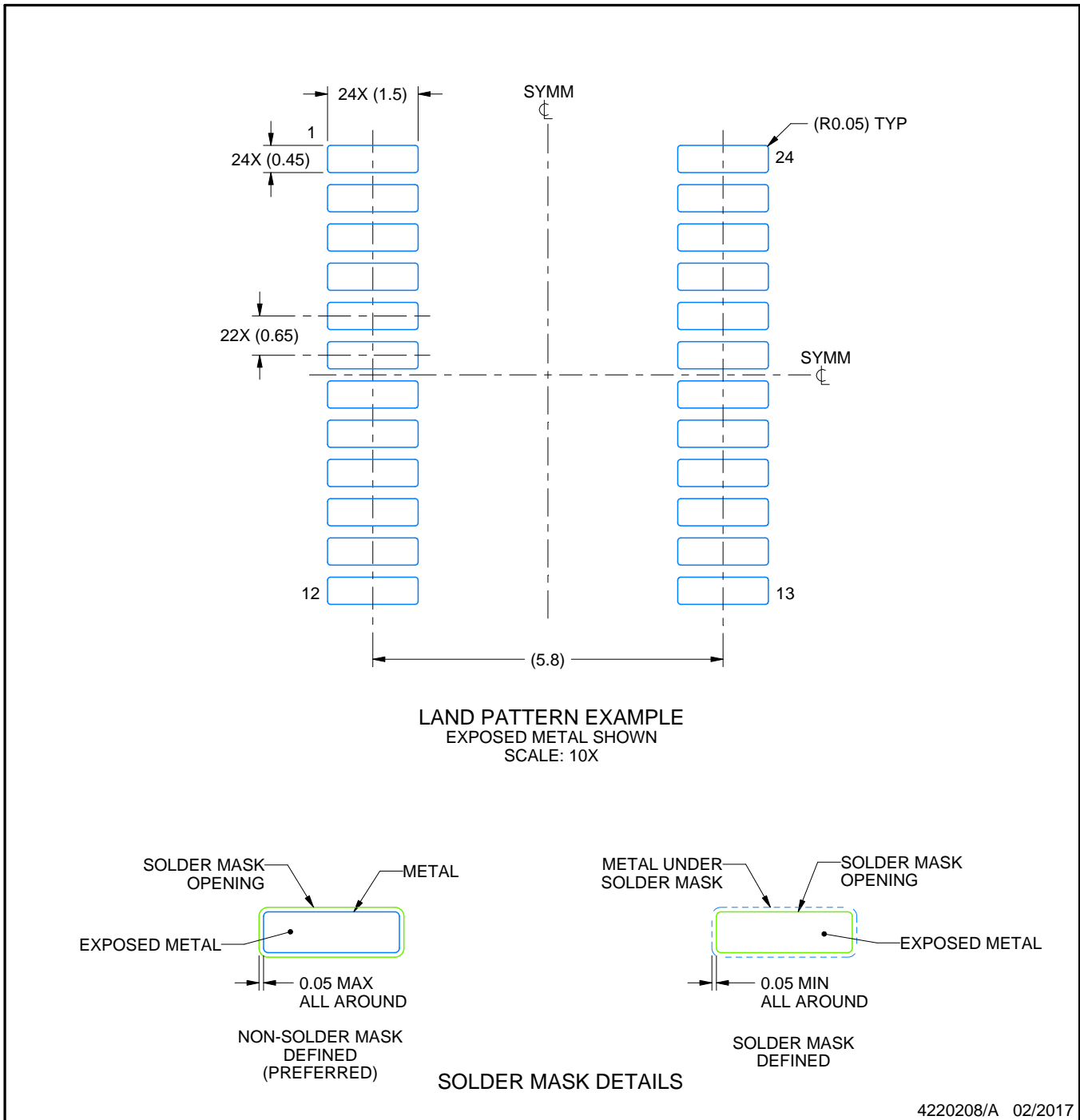
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE

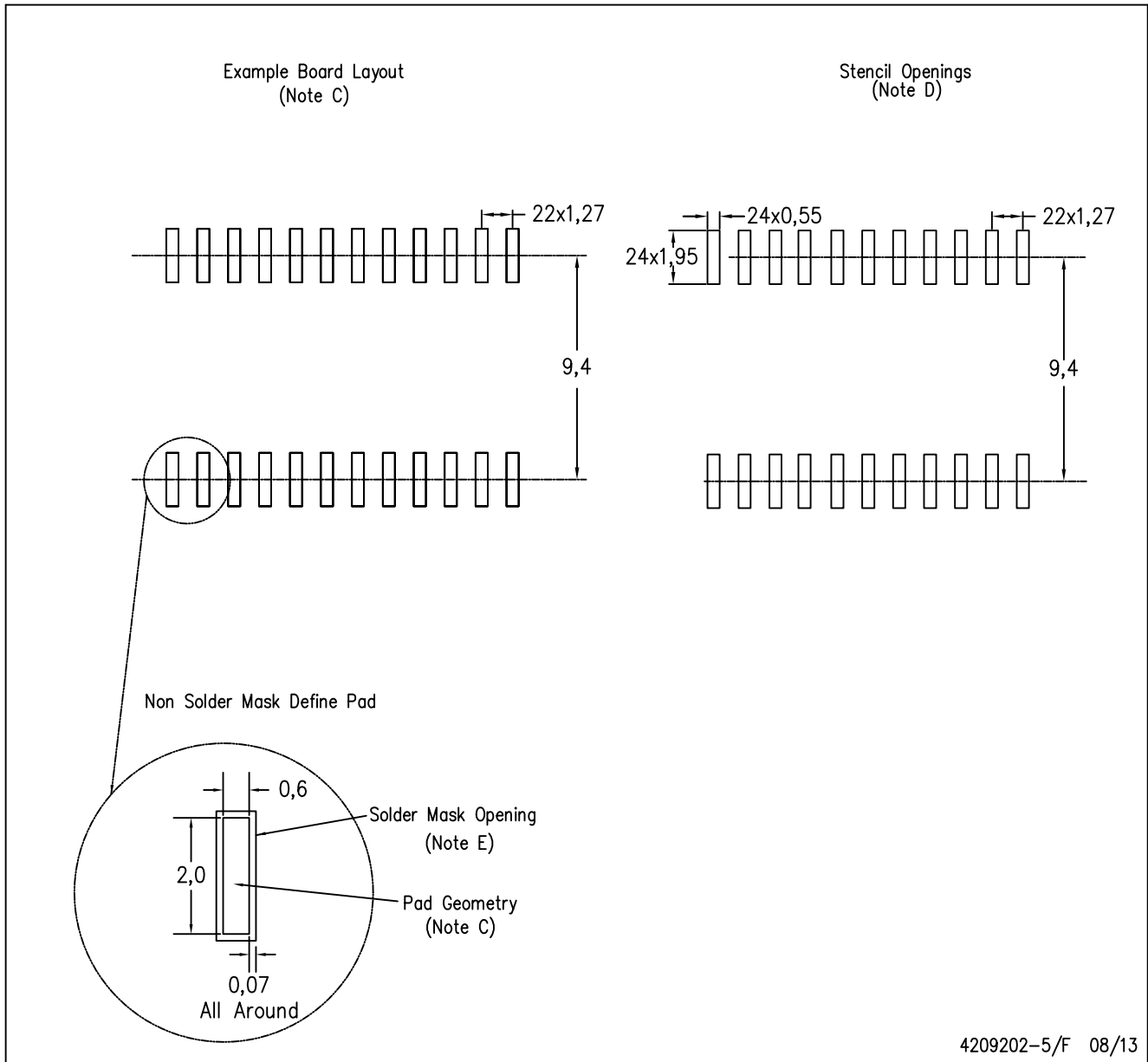


- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.



DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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